

REMARKS

The above amendments to the above-captioned application along with the following remarks are being submitted as a full and complete response to the Official Action dated February 11, 2005. In view of the above amendments and the following remarks, the Examiner is respectfully requested to give due reconsideration to this application, to indicate the allowability of the claims, and to pass this case to issue.

Status of the Claims

Claims 1-4, 7-12 and 18-19 are under consideration in this application. Claims 13 and 17 are being cancelled without prejudice or disclaimer. Claims 1-4, 10, 12 and 18 are being amended, as set forth above and in the attached marked-up presentation of the claim amendments, in order to more particularly define and distinctly claim Applicants' invention.

Additional Amendments

The claims and the drawings are being amended to correct formal errors and/or to better disclose or describe the features of the present invention as claimed. Applicants hereby submit that no new matter is being introduced into the application through the submission of this response.

Formality Rejection

The drawings were objected to for failing to show the claimed features recited in claims 1 – 4, 7 and 10, and especially the deficiencies in Figures 6B and 12B. Claims 13 and 17 were rejected under 35 U.S.C. §112, second paragraph, for being indefinite.

As indicated, claims 13 and 17 are being cancelled without prejudice or disclaimer, and Fig. 6B is being amended as required by the Examiner. As to Fig. 12B, Applicants respectfully point out that Fig. 12B shows the alternating mode first, and then the repeating mode D11 -> D21 -> D12-> D22 -> ... D3m -> D4m ->... D51-> D51-> D52-> D52 such that there is no need to revise Fig. 12B. Accordingly, the withdrawal of the outstanding informality rejection is in order, and is therefore respectfully solicited.

Prior Art Rejection

Claims 1 - 4, 7 - 12 and 18 - 19 were rejected under 35 U.S.C. §103(a) as being unpatentable over US Patent No. 6,462,727 to Shin in view of Japanese Patent Reference No.

04-168417 to Takahara et al. and US Patent No. 6,067,063 to Kim et al. (hereinafter “Kim”). These rejections have been carefully considered, but are most respectfully traversed.

The liquid crystal display device of the invention (e.g., Figs. 1, 6A), as now recited in claim 1, comprises: a liquid crystal display element 10 with a plurality of drain signal lines D; a plurality of driving circuits 130 including a first driving circuit and a second driving circuit, each of the driving circuits having a plurality of output terminals; and a display control device 110 transmitting display data DATAIN *alternately* to one of the output terminals of the first driving circuit and to one of the output terminals of the second driving circuit which is arranged next to the first driving circuit (p. 17, lines 7-13; p. 27, lines 7-13; Fig. 6B: D21 -> D21 -> D22-> D22 -> ... D1n -> D2n ->... D31-> D41-> D32-> D42 ...). At least one of the first and second driving circuits has at least one output terminal being not connected to the drain signal lines (e.g., “a first drain driver DRV1 has 1 to (n-1) output terminals which are not connected to the drain signal lines” p. 28, lines 24-27 and Fig. 6A; “the last drain driver DRV4 has unconnected output terminals” p. 33, lines 8-12 and Fig. 10; “the drain drivers DRV1 and DRV2 have unconnected output terminals...[on] arbitrary positions” p. 34. Lines 12-15 and Fig. 13) and each of the remaining output terminals being connected to one of the drain signal lines. The display control device transmits to said output terminal being *not connected* to the drain lines “a display datum D21 having an identical voltage with a display datum D21 being transmitted prior or subsequently to an output terminal being *connected* to one of the drain signal lines”(e.g., “D21 -> D21” in amended Fig. 6B, “D51 -> D51” in Fig. 12B; p. 32, lines 12-20; “data to be transmitted to unconnected output terminal portions (ineffective display data) become the same display data as those of the drain driver DRV3” p. 33, lines 24-26), i.e., the “identical-voltage” feature.

The present invention, as now recited in claim 3, is also directed to a liquid crystal display device as recited in claim 1, except that the plurality of driving circuits including at least one *odd numbered* driving circuit and at least one *even numbered* driving circuit (rather than just a first and second), and that the even numbered driving circuit is *paired with* and arranged next to the odd numbered driving circuit.

The present invention, as now recited in claims 2 and 4, mirror claims 1 and 3, respectively, but broader to cover all display devices (beyond liquid crystal display devices).

The present invention, as now recited in claim 7 (Fig. 7), is also directed to a liquid crystal display device as recited in claim 3, having a first storing means 20 (“odd-numbered

memory” p. 27, lines 17-21; Fig. 7) for storing display data for said odd numbered driving circuit which are inputted externally and a second storing means 21 (“even-numbered memory”) for storing display data for said even numbered driving circuit which are inputted externally, and that the display control device reads out the display data from the first storing means and the second storing means alternately (p. 31, lines 6-12) to transmit to said output terminals being connected to one of the drain signal lines. In particular, before transmitting a display datum D21 to said output terminal being not connected to the drain signal lines (e.g., any one of the terminals 1-(n-1) of DRV1 in Fig. 6A), the display control device 110 reads out from one of said first and second storing means “a display datum D21 having *an identical voltage* with a display datum D21 to be transmitted immediately prior or subsequently to transmitting said display datum to said output terminal being not connected to the drain signal lines (e.g., terminal 1 of DRV2)”, and then repeatedly transmits said display datum D21 to (1) said output terminal being not connected to the drain signal lines (e.g., terminal 1 of DRV1) and (2) an output terminal being connected to one of the drain signal lines and scheduled to receive said display datum immediately prior or subsequently to the transmitting of said display datum to said output terminal being not connected to the drain signal lines (e.g., terminal 1 of DRV2), i.e., the “**repeated-data**” feature.

For example, in Fig. 6B (p. 32, lines 12-20), “*display data are transmitted in the order of D21, D21, D22, D22, D23, D23...*”(“repeating mode”) until running out of unconnected output terminals then switching back to “D1n, D2n, D1n+1...” (“alternating mode”), i.e., the “dual-mode” feature. As such, a plurality of drivers DRV1 to DRVn share a common display control device 110 which includes a pair of memory 20, 21 so as to reduce the cost of the display panel (p. 43, lines 3-5). Accordingly, “*during transmission of display data containing ineffective display data, it is possible to reduce the transmission frequency on the bus line, whereby it is possible to reduce the amount of generation of radiant electromagnetic noise* (p. 32, last paragraph)”.

Applicants respectfully contend that none of the cited references teaches or suggests such a “identical-voltage” or “repeated-data” feature.

In contrast, Shin merely discloses “the first odd data d1 and the first even data d2 are sent to the first odd data driver IC 240 and the first even data driver IC 250, respectively (Col. 5, line 63 – Col. 6, line 2).” As admitted by the Examiner (p. 4, lines 4-6 of the outstanding office action), Shin does not show any output terminal being *not connected* to the drain lines.

Takahara merely discloses skipping an unused pin, but does not disclose the datum transmitted to the unused pin a datum having an **identical voltage** as or **repeating** the datum transmitted to the used pin, or the problem of the transmission frequency on the bus line. As admitted by the Examiner (p. 4, lines 17-20 of the outstanding office action), Shin and Takahara do not teach that the display control device transmits to said output terminal not being connected to the drain signal lines a display datum being transmitted prior or subsequently to an output terminal connected to one of the drain signal lines.

Kim was relied upon by the Examiner to teach such a feature. However, Kim merely discloses that adjacent pixels in a LCD having the same gray level are supplied with *different* (rather than "*identical*") magnitude voltages U_i, V_i . Kim further does not disclose adjacent pixels in a LCD being supplied with a "*repeated*" display datum as the one to the pixel.

"FIG. 5 shows an embodiment of the circuitry for the two gray voltage producing circuits 45 and 46 shown in FIG. 4. Each gray voltage producing circuit 45 and 46 has a group of resistors and the groups are connected in parallel, as shown in FIG. 5. In the case of eight gray levels, each group has nine resistors R_0 to R_8 or R'_0 to R'_8 . In FIG. 5, V_0 to V_7 are the gray voltages to be delivered to one data driver and U_0 to U_7 are the gray voltages to be delivered to the other data driver. The resistors are selected so that at least one of R'_x is not equal to R'_x (for $x=0$ to 8), so that the magnitude of the voltage V_i ($i=0, 1, \dots, 7$) is not equal to the corresponding voltage U_i . Therefore, when a pixel receives the voltage V_i , the adjacent or contiguous pixels having the same gray level will receive the voltage U_i (col. 5, lines 26-40)".

Contrary to the Examiner's assertion that it would have been obvious to one skilled in the art at the time of invention to combine Kim with Takahara as suggested by the Examiner, one skilled in the art would not be motivated to do so merely based upon both references generally including LCDs, since Kim does not show any output terminal being *not connected* to the drain lines while Takahara does.

Even if, *arguendo*, a person of ordinary skill were motivated to combine the teachings in Takahara and Kim, such combined teachings would still fall short in fully meeting the Applicants' claimed invention as set forth in claims 1-4, 7 and 10 since Kim does not show the identical voltage datum or repeated datum (having identical pulse form, frequency, etc. in addition to the voltage level) being transmitted prior or subsequently to an output terminal being connected to one of the drain signal lines. As discussed, there is no teaching of the identical-voltage feature in Kim, Takahara or Shin.

Accordingly, the present invention as now recited in all the claims is distinguishable and thereby allowable over the rejections raised in the Office Action. The withdrawal of the outstanding prior art rejections is in order, and is respectfully solicited.

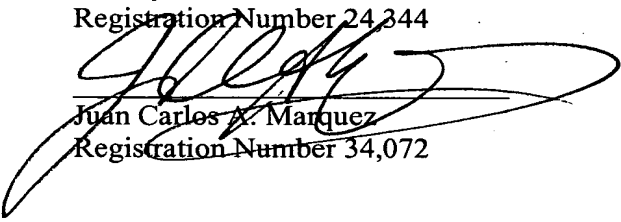
Conclusion

In view of all the above, clear and distinct differences as discussed exist between the present invention as now claimed and the prior art reference upon which the rejections in the Office Action rely, Applicant respectfully contends that the prior art references cannot anticipate the present invention or render the present invention obvious. Rather, the present invention as a whole is distinguishable, and thereby allowable over the prior art.

Favorable reconsideration of this application is respectfully solicited. Should there be any outstanding issues requiring discussion that would further the prosecution and allowance of the above-captioned application, the Examiner is invited to contact the Applicant's undersigned representative at the address and phone number indicated below.

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SPF/JCM/JT

IN THE DRAWINGS:

Please enter the attached corrected drawings Fig. 6B, in which reference number "D11" is being changed into "D21" and "D12" is being changed into "D22", to replace Fig. 6B as originally filed. A Letter to Draftsperson is also submitted herewith.